

GOANNA NEWS – Late February 2022

What is in this issue of Goanna News?

I present some of the results of our tracking of the highly-sought-after female goannas. Also here is the first revelation of our new ability to continuously record temperature and accelerometer data, thanks to customised software from Telemetry Solutions. I also report good news about the road maintenance situation in Naas Valley. Last but not least, this issue announces a new volunteer activity, starting this month, to find goanna nests just after egg laying.

Latest communications

A talk was presented to the ACT Herpetological Society on 15 February, and in late January some of us participated in an informal meeting with Shane Rattenbury and Rebecca Vassarotti, the two ministers from the ACT Greens Party.

The talk was mainly about a camera survey for Rosenberg's Goanna that was carried out on Mt Ainslie 12 months ago. The talk also covered ways that the management of Ainslie Majura Nature Reserve could be changed to save this last remaining population of goannas in Canberra Nature Park. The main requirement is to control foxes, which necessitates restriction of dog walking areas, so it will take time to introduce and will need to be sold persuasively to the community. In the talk, I also provided a quick update on our Naas Valley research.

The management of Ainslie Majura Nature Reserve was also one of the topics discussed at the informal meeting (Figure 1). The meeting was brought about by Esther, who cleverly and generously used a Conservation Council fund-raising initiative to NPA advantage. Everyone can help goanna conservation by **communicating about goannas** to raise public and official awareness of these important but under-rated species.

Figure 1: Informal meeting: John and Rebecca deep in conversation



Synopsis for 2021

Because of Covid and *la Nina*, 2021 has seemed to be the hardest year of the project. Yet up to 1st Feb this season, 924 hours have been volunteered by 31 individual participants, a fantastic contribution in spite of rainy weather, Covid restrictions, and cancellations and difficulties due to flooding. Cancellations included the 2021 student camp.

Hatchling Patrols

Hatchling Patrols in spring were successful, because they are mainly near the park entrance, so few or no river crossings are required. And fortnightly monitoring worked, rather than weekly. The goannas used a new set of termite mounds, rather than repeated use of the eighteen nest mounds used last year. In the two years combined we found 1 in 5 termite mounds were used by goannas for nesting.

Summer Nest Patrols?

Given our success and growing experience with hatchling patrols, it makes sense to try a slightly more difficult variation which offers potentially greater rewards, i.e. to detect nests at the time of laying. We'll start that trial on dates that suit the participants, beginning 22 Feb. **Let me know if you are interested in helping, so on your first visit I can team you with one of the experienced people.** Requirements include the ability to bushwalk for a couple of hours, from mound to mound, following the GPS in your smart-phone. And while Covid is still active, independent transport is desirable, preferably 4WD, or at least to get yourself to the Namadgi Visitor Centre.

Movement data from female goannas

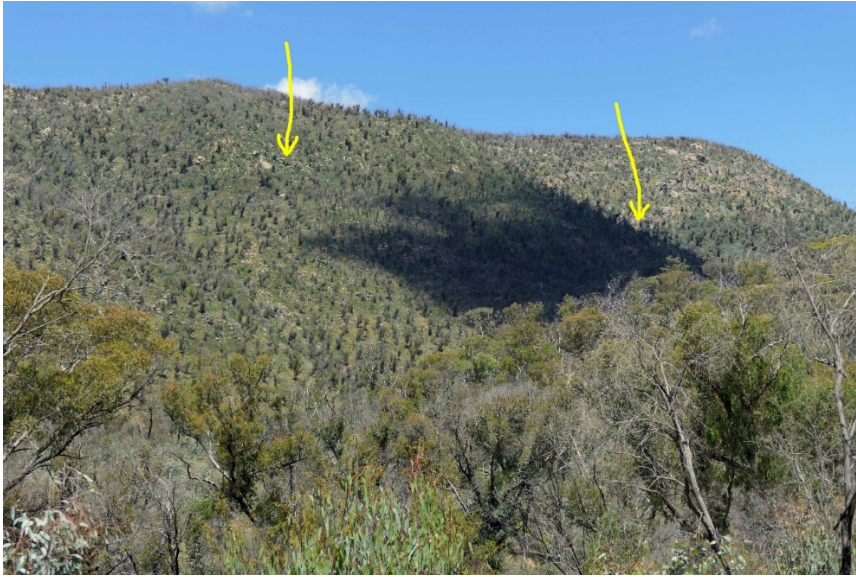
The highest priority this year was to obtain movement data from female goannas across the full active season. Over the years, every step in the process has provided unexpected challenges. First we must trap female goannas (took three years to learn how), then attach GPS packs so they stay on, then monitor the females well enough to spot packs about to be shed in time to re-glue them (much harder for female than for male goannas), and fourth, we need to recapture all females in December-January to exchange exhausted GPS packs for new ones. The fourth was a new requirement this year to enable more GPS data to be obtained per day. It sounds simple but involved many failed attempts.

22nd January proved to be a positive turning point! John and I drove through the first four river fords and walked past the next three, to reach the two least-accessible female goannas (Figures 2, 3). Because we had neglected them for so long due to the flooded fords, I expected both GPS packs would have been shed, but we were lucky. We had to dig both females from rocky 'bolt holes' well up the side of the Clear Range, but managed to replace their now-exhausted GPS backpacks with fresh ones. Unfortunately, I had carried only enough glue for one goanna, so our trip had to be repeated the next day to return the second goanna, 'M7'. What an epic! We were tired!

Figure 2: Crossing the Naas River opposite M7, carrying the radio tracking antenna

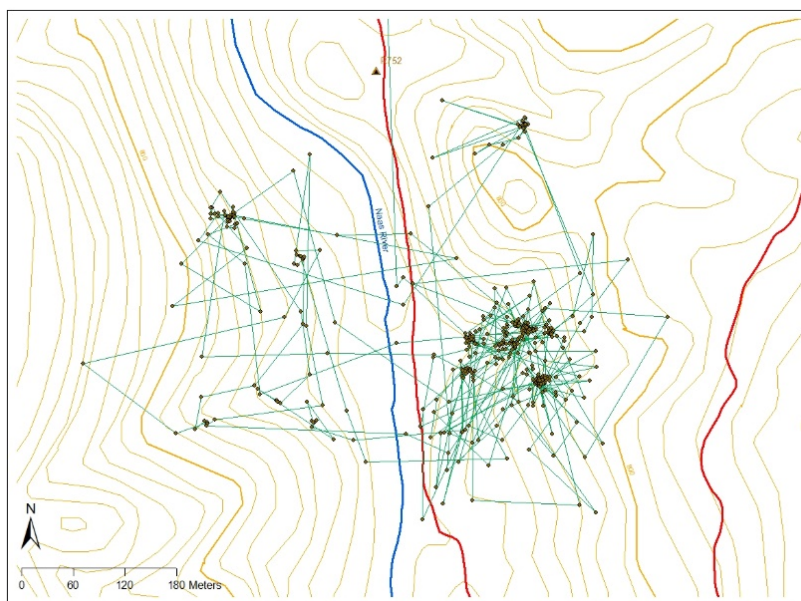


Figure 3: Left arrow locates the M7 burrow, across the Naas River and high up the Clear Range – higher than a previous M7 capture location indicated by the right arrow.



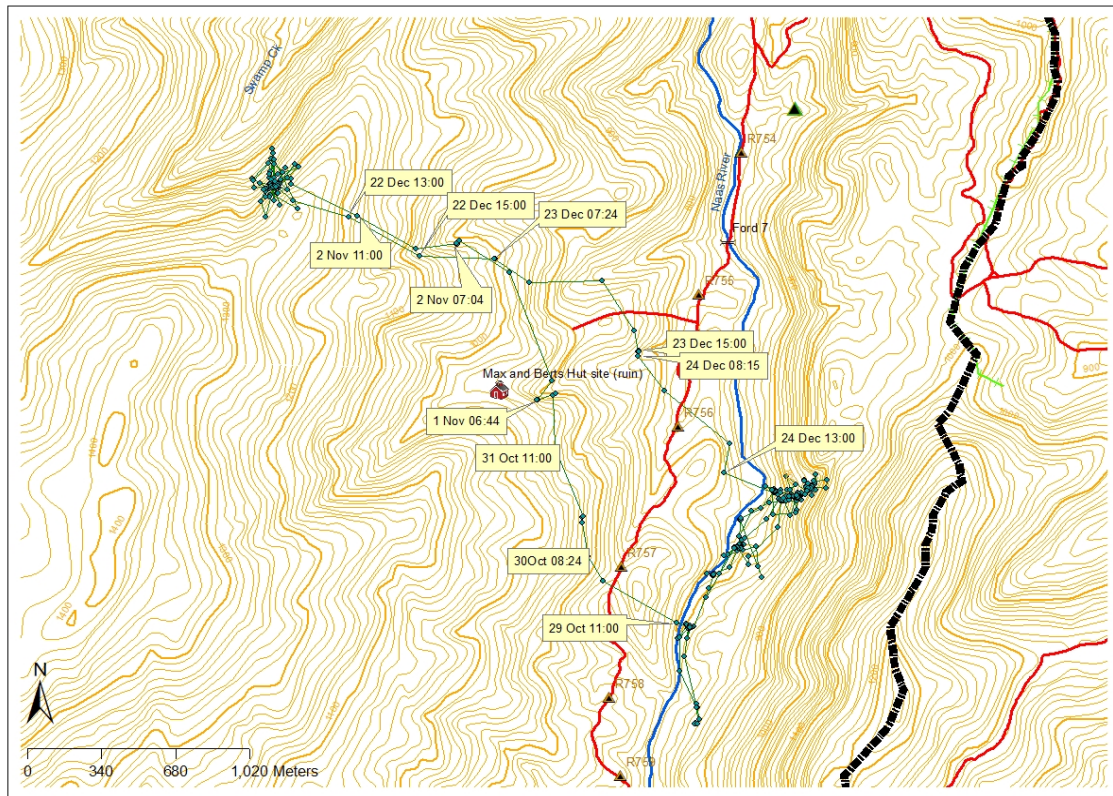
The hard-won data from these two female goannas have justified our efforts. I'll turn first to Hollow Square. The data from her GPS pack (Figure 4) show that she occupies a small home range of compact shape, compared to male goannas. She spends a lot of time in a small number of places, and relatively little time moving between them and around her home range. Data from the easier-to-reach females are much the same. Given what we know of male Rosenberg's Goannas, the movements of Hollow Square are what would be predicted from knowledge of terrestrial vertebrates, and reptiles in particular. I am immensely pleased, although this result may seem boring to some. We just had to have a season of data from several females to complete our picture of the home ranges and movements of Rosenberg's Goannas in the Naas Valley, and that will be achieved if everything keeps working until late March. But surprises are still possible, because we have never had data from breeding females at egg-laying time in February. And there is M7.

Figure 4: Movements of female goanna Hollow Square appear so far to be what would be expected



M7 is the smallest goanna we have tracked. Last year M7 appeared to range across an area many times larger than the largest male. She moved repeatedly from near the Murrumbidgee, over the Clear Range to the Naas River, and then further west over Carpark Ridge to the valley of Swamp Ck. This year we had a better GPS available to fit to her, indeed two of them, and we were able to schedule six times as many GPS fixes per day. This finer resolution proved important. Rather than M7 ranging across a massive home range, what we now see is that M7 is making purposeful out-and-back movements between small discrete areas (Figure 5).

Figure 5: Movements of female goanna M7 in the first half of the 2021/22 active season.



This is still a pattern like nothing else we have seen. Is M7 exceptional because she is not female but is the only juvenile male accidentally included in the study? Or is M7 a female whose only access to *Nasutitermes* mounds is in the valley of Swamp Ck? (There are no termite mounds near her main home range.) And does that cluster of GPS fixes in the valley of Swamp Ck include the site of her 20/21 nest, which she visited at hatchling emergence time this season? These questions can be answered. DNA from a blood sample taken last year can reveal her sex with certainty when we get it analysed. And if there is a termite mound in the place where she goes in Swamp Ck, we should be able to find it.

Eventually the last female GPS pack was replaced - on goanna E3 (Figure 6). So we hope for a lot of good data through February and March from the renewed GPS packs on these goannas.

Figure 6: Waiting for the glue to dry on the final female GPS pack replacement (visible in bag).



Even E3 proved difficult, often retreating into one of several rocky burrows before we saw her. Unlike other goannas, once she was in these burrows, we repeatedly failed to get a download of her GPS data. Then I made an error that caused us to start pursuing her on the wrong VHF radio tracking frequency. Thinking her VHF radio must have failed, and that we were now reliant only on the GPS, as an emergency measure we installed an automatic base station (solar powered) to obtain GPS data when she surfaced. The base station operates through a high-gain aerial in the top of a tree. I enjoy trees. The views are lovely, but I'm not *Antechinus agilis*. There are only a few trees I can safely climb without the burden of carrying masses of arborist equipment up the hill (Figure 7).

Figure 7: Automatic GPS base station with high-gain aerial mounted in a tree. If only I could scamper up trees like *Antechinus agilis*, I could have a lovely time on every visit, enjoying vistas like this one along the Nass Valley.



Thermal behaviour of GPS-tracked goannas

Reptiles are ruled by temperature. They skilfully schedule their activity and adjust their physical position to take advantage of thermal characteristics of their environment. To help us understand

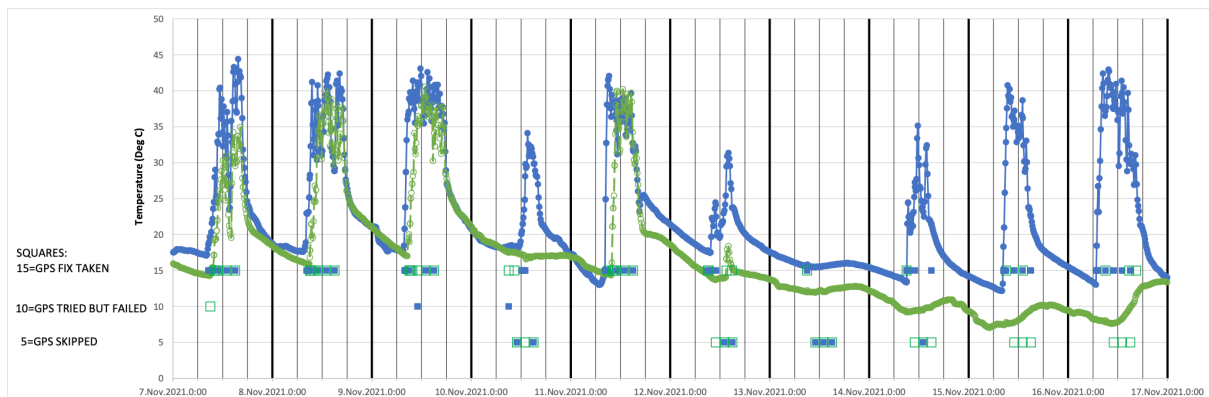
their movements it makes sense to monitor their skin temperature. The temperature of the GPS pack is an approximation to that.

Excellent support from Telemetry Solutions' president, Quintin Kermeen, in California, and his software engineer Honja (Jan) Kresna in the Czech Republic, has enabled us this year to continuously monitor temperature and acceleration (movement) of all the GPS packs. I set the packs to record temperature every 5 minutes (males) or 10 minutes (females). Also the new firmware means that an additional GPS fix can be taken whenever there is a large and rapid change in temperature, even if the goanna only moves a little way slowly, as they do when emerging from their night burrow. This too turned out to be a valuable addition.

The resulting data provide greater understanding how the goannas live, and they enable refinement of the 'Smart GPS' settings which control when the GPS engine operates, but a downside is that there will be 25 or 50-thousand additional rows of data per season. There have been a few minor teething problems (this is not a mature system commercially available), but it turned out that our sore teeth were mainly related to us not knowing the peculiarities of running two base station receivers simultaneously, each with a 7 minute time-limit for downloads.

The results are fascinating, as illustrated for the two female goannas that John and I had struggled so hard for. Over the months, the temperatures of M7 and Hollow Square are remarkably similar, more so than in the 10-day segment I chose for Figure 8. In the figure, the bold vertical lines mark the beginning of each day at midnight and the light vertical lines are at 0600, midday, and 1800. Temperature measurements in the GPS pack on Hollow Square are marked as filled blue circles joined by continuous blue lines. Hollow green circles and dashed lines are from M7.

Figure 8: GPS temperature of two female goannas and status of GPS fix attempts



The GPS fixes in this period (square symbols) are very satisfactory. We prefer as many GPS fix attempts as possible to be successful (top row of squares). And we want to minimise the number of failed fix attempts (middle row of squares) when the GPS searches for satellite signals but fails because the goanna is underground or in some other unfavourable position. Rather than wasting battery on failed fix attempts, it is better for the fix to be skipped (lowest row) which is what should happen when insufficient movement has been recorded on an accelerometer to switch on the GPS engine. The settings in the 'Smart GPS' feature of the software seem to have achieved that well for these two goannas, with only two failed fixes, plenty of successful fixes, and with the maximum allowed number of skips on inactive days.

There is a lot of detail about goanna behaviour evident in these 10 days. Skip ahead to the next section if that does not interest you. Throughout the full period recorded (October-January), most days are like the first three days illustrated here. Both goannas are at about the same temperature when active. And at night, M7 gets only slightly colder. During the time period illustrated in Figure 8,

M7 is living at 1200 m ASL and Hollow Square is down at 760 m, where the air would have been about 2.8 degrees warmer (based on the moist adiabatic lapse rate of 6.4 deg/km). So to have maintained the same night temperature as Hollow Square, M7 must have had an effective night burrow.

The difference between the two goannas is greater in the second half of the period illustrated, when M7 shows no sign of activity and is generally about 4 degrees colder at night than Hollow Square. The temperature of her GPS pack declined to as low as 7 degrees in the early hours of 15 Nov. The minimum at Tuggeranong at this time was also 7 degrees. Thus M7 appears to have got only limited benefit from her burrow on these few days. It is unlikely that she was lying out on the surface, because she never received any warming radiation during the daytime. Perhaps M7 was digesting a big meal, but in that case I would expect more attempts to find warmth, because digestion would be more efficient if she was warm. Or perhaps she was sheltering in a hollow log rather than a burrow? I don't know what she was doing, but if M7 was a mammal she would have been dead.

Other fauna and flora

What a wonderful season it has been for all kinds of plants, and the insects that utilise them! Here are photos of a few (Figures 9 to 11).

Figure 9: *Bulbine* and flies; Buttercup and *Melangyna* Hoverfly; Blotched Hyacinth Orchid



Figure 10: Yellow-striped Hunter; Willow Herb Day-moth; and Australian Blackthorn. Blackthorn is flowering prolifically where it was killed by drought but is not yet flowering where it was burnt.

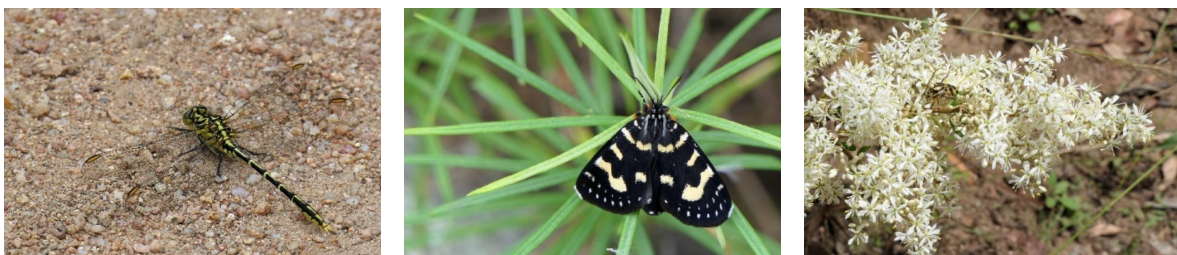


Figure 11: Native Sorghum is also having a good year, as are Common Bronzewings which fill up on seed and grit from the surface of the fire trail.



Access – rivers and roads – Excellent news

Following the 2020 bushfire and a damaging rain storm, a second storm in November 2020 severely damaged the Naas Valley Fire Trail (NVFT). Funds have long been unavailable for emergency repairs or even normal preventative maintenance so it is terrific news that work is now about to start.

Flooding of river crossings from about October, and boggy conditions in certain spots, have restricted access. Due to internal restrictions placed by PCS, ours have been the only vehicles using the roads for some time now. And it has been made very clear that no rescue or support would be forthcoming if we needed it. Therefore we carry a lot of vehicle recovery and safety equipment and travel in two 4WDs (Figure 12).

Figure 12: As well as goanna gear, we carry a lot of vehicle recovery and safety equipment and travel in two 4WDs. This was the first trip after one of the minor floods so the shovel is in a handy place because it will be needed at almost every ford. The 1.8 m boards on the roof are more effective than the Max Trax pictured. The need for the chainsaw is obvious.



Figure 13: Road damage done in a 2020 post-fire rainstorm.



About 'Goanna News' and the NPA Goanna Project

'Goanna News' is an irregular series of emailed updates about the [NPA Goanna Project](#) which usually contain plenty of photos.

Key people in the project are interested in conservation of populations of both species of goannas in the region, and potentially their restoration, but our main activity has been research on a population of Rosenberg's Goanna in the Naas Valley within Namadgi National Park. That research is 100% citizen science, in that none of us receive payment for our time. The equipment has been purchased from the NPA's Bubb Bequest, from two ACT Government Environment Grants, and from public donations through the [NPA donations page](#). We commenced in Naas Valley during the 2017/18 goanna active season (late-September to mid-April). Goanna surveys have also been conducted at Bluett's Block (Denman Prospect) and Ainslie Majura Nature Reserve.

Because the key people are part-time (helped occasionally by lots of other part-timers and some students) progress has been slow compared to e.g. a typical PhD project. But progress has been orderly and steady. If you are interested in finding out more, our 'governance' documents are available on request, of which the principal one is the Project Outline, updated annually. We also have documents covering: Goanna Processing Flowchart and Instructions, Hatchling Patrol Instructions, and our Citizen Science Policy on the way this project will be conducted, which covers issues like data access and publication authorship.

Goanna News can be emailed to anyone who has shown interest in the project. Project updates are also available publicly as articles in the [NPA Bulletin](#) for [Mar 2018](#), [Jun 2018](#), [Mar 2019](#), [Jun 2019](#), [Sep 2019](#), [Dec 2019](#), [June 2020](#), [Oct 2020](#), [June 2021](#), and [Nov 2021](#). Another update will be published in the March 2022 edition.

If you do not want to receive 'Goanna News' emails, just tell me and I'll remove your name from that email group. There is also a smaller overlapping email group for people actively participating in field work or wishing to do so.

Cheers, Don Fletcher